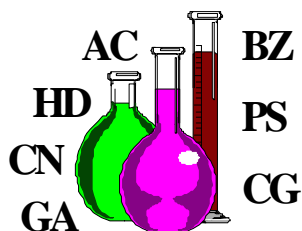


*U.S. Army Center for Health Promotion and Preventive Medicine*

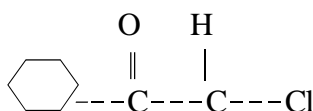


***Detailed Facts About Tear Agent Chloroacetophenone  
and Chloropicrin in Chloroform  
(CNS)***

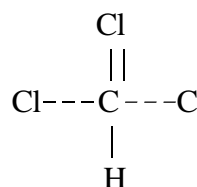
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***Physical Properties of Tearing Agent Chloroacetophenone  
and Chloropicrin in Chloroform***

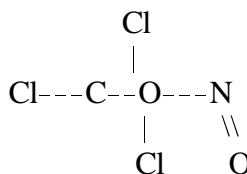
***Chemical Structure***



chloroacetophenone  
(23.0%)



chloroform  
(38.5%)



chloropicrin  
(38.5%)

***Chemical Formula***

Chloroacetophenone (CN) -  $C_6H_5COCH_2Cl$   
(23 percent)  
Chloropicrin (PS) -  $C(NO_2)Cl_3$   
(38.4 percent)  
Chloroform -  $CHCl_3$   
(38.4 percent)

***Description***

CNS is a clear liquid smelling like flypaper; it has an immediately strong irritating effect on the eyes and respiratory tract. CNS may cause severe nausea.

***Molecular Weight***

141.78 (based on components)

**Agent CNS** - The chemical mixture of chloroacetophenone and chloropicrin in chloroform. Chemical Abstract Service Registry Number is not available.

<b><i>Boiling Point</i></b>	Begins at 60°C with chloroform and is complete with boiling of CN at 247°C.	
<b><i>Vapor Pressure (mm Hg)</i></b>	78 @ 20°C	
<b><i>Freezing Point</i></b>	2°C; this is the point at which crystals of CN separate and is not a true freezing point as in the case of a pure compound.	
<b><i>Density</i></b>	Liquid = 1.47 g/cc @ 20°C Vapor = approximately 5.0 (air = 1)	
<b><i>Solubility</i></b>	No data available.	
<b><i>Flash Point</i></b>	None.	
<b><i>Volatility</i></b>	605,000 mg/m <sup>3</sup> @ 20°C 900,500 mg/m <sup>3</sup> @ 30°C 1,620,000 mg/m <sup>3</sup> @ 50°C	
<b><i>Toxicity Values</i></b>	ICt <sub>50</sub>	= 60 mg-min/m <sup>3</sup>
	LCt <sub>50</sub>	= 11,400 mg-min/m <sup>3</sup>

#### ***Exposure Limits***

##### Alpha-Chloroacetophenone (CN)

Workplace Time-Weighted Average -	0.3 mg/m <sup>3</sup>
General Population Limits -	0.32 mg/m <sup>3</sup>

##### Chloropicrin

Workplace Time-Weighted Average -	0.7 mg/m <sup>3</sup>
General Population Limits -	0.67 mg/m <sup>3</sup>

##### Chloroform

Workplace Time-Weighted Average -	240 mg/m <sup>3</sup>
General Population Limits -	49 mg/m <sup>3</sup>

### ***Toxic Properties of Tear Agent Chloroacetophenone and Chloropicrin in Chloroform***

*CNS is a formulation of chloroacetophenone (CN). CNS was formulated not so much as a tear agent but as a vomiting agent. CNS was an American chemical warfare materiel developed after WWI; it has a mixture of 23 percent chloroacetophenone (CN), 38.4 percent chloropicrin (PS), and 38.4 percent chloroform.*

### ***Overexposure Effects***

CNS is an example of multiple-component mixtures developed to achieve desired dissemination characteristics. Its hazards exist for inhalation, ingestion, and skin and eye exposure. It produces nausea within a minute of inhalation by a moderately sensitive person. If inhaled for longer periods, vomiting, colic (severe abdominal pains and cramps), and diarrhea are to be expected in its victims. Persons who are exposed to very large quantities of the vapors or liquid concentrations may suffer these symptoms for weeks. CNS is a non-lethal choking agent. It will cause the victims to gasp for air (thus inhaling more CNS) while causing discomfort to the bronchial tubes and lung sacs. CNS vapors may go into solution with sweat, making it a skin irritant, especially the face. If allowed to penetrate the clothing, CNS will cause stinging under the armpits, elbows, knees, and the area around the crotch and buttocks. Skin rashes may result after prolonged exposures. Prolonged eye exposure would not be recommended.

### ***Emergency and First Aid Procedures***

Inhalation: remove the victim to fresh air immediately; perform artificial respiration if breathing has stopped; keep victim warm and at rest; seek medical attention immediately.

Eye Contact: wash eyes immediately with copious amounts of water, lifting the lower and upper lids occasionally; do not wear contact lenses when working with this chemical; seek medical attention immediately.

Skin Contact: wash the contaminated skin with soap or mild detergent and water immediately; remove the contaminated clothing immediately, and wash the skin using soap or mild detergent and water; seek medical attention immediately when there are chemical burns or evidence of skin irritation.

Ingestion: induce vomiting by having victim touch the back of his throat with finger or by giving victim syrup of ipecac as directed; do not induce vomiting if victim is unconscious; seek medical attention immediately.

### ***Protective Equipment***

Protective Gloves:                      Wear impervious gloves.

Eye Protection:                        Wear dust- and splash-proof safety goggles where there is any possibility of solid CNB or liquids containing CNB contacting the eyes; wear appropriate protective mask.

Other:                                      Wear a complete set of protective clothing to include gloves and lab coat, apron, boots, plastic coveralls; other protective clothing and equipment should be available to prevent contact with skin or clothing; remove contaminated clothing immediately; do not wear clothing until it has been properly laundered.

### ***Reactivity Data***

Stability: Stable in storage.

Hydrolysis Rate: Does not readily hydrolyze.

Hydrolysis Products: Hydrogen chloride and a hydroxyacetophenone.

Corrosive Properties: Very little.

***Persistence*** Short.

### ***References***

1. Code of Federal Regulations, Part 1910.1000, Title 29 (29 CFR 1910.1000), *Air Contaminants*, 1994.
2. Department of the Army Field Manual (DA FM) 3-9, *Potential Military Chemical/Biological Agents and Compounds*, 1990.
3. *The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Eleventh Edition*, Merck & Co., Inc., Rahway, New Jersey, 1989.
4. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 1995-1996*, American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, Ohio.
5. U.S. Army Chemical Command Materiel Destruction Agency, *Site Monitoring Concept Study*, 15 September 1993.

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